

Appl. No. : 10/814,319  
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#### REMARKS

By way of summary, Claims 1-6, 9-41, and 55-76 are pending. Claims 42-54 are allowed by the Examiner. Claims 6, 17-18, 24, 26, 31-41, and 55-74 were previously withdrawn in response to a Restriction Requirement. This Amendment amends Claims 19 and 27 as presented above.

#### Allowable Subject Matter

Once again Applicants thank the Examiner for allowing Claim 42 - 54.

#### Response to Arguments

On April 29, 2008, the undersigned and the Applicants conducted a telephonic interview with the Examiner. The Examiner and the Applicants discussed whether there would be any significant changes to the system disclosed by Lin et. al. (U.S. Patent No. 6,570,892) if the variable attenuator were to be placed external to the oscillator. Applicants' response was filed on May 23, 2008. In the Office Action dated August 21, 2008 (pages 2-3), the Examiner indicated Applicants' arguments were not persuasive.

The remarks previously presented by the Applicant in the response dated May 23, 2008 are incorporated herein by reference. Applicants maintain the position set forth therein. Moreover, Applicants submit that the conclusions based on the combination of Lin and Price as set forth in the August 21, 2008 Office Action are flawed. Applicants discuss these flaws below.

#### Claim Rejections Under 35 U.S.C. § 103

The Office Action rejects Claims 1-5, 9-16, 19-23, 25, 27-30 and 75-76 under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 6,570,892 by Lin et. al. in view of U.S. Patent No. 6,813,429 by Price et. al.

#### Claim 1

With regard to Claim 1, the Office Action states that Lin teaches an amplification system comprising a modelocked fiber oscillator, an amplifier, a variable attenuator, and a compressor but that Lin does not teach that the amplifier, variable attenuator, and compressor are external to the fiber oscillator. According to the Office Action, Price discloses pulsed fiber laser system having a modelocked fiber oscillator that is external to the other system components. The Office

Action concludes that it would have been obvious to one of ordinary skill in the art at the time of the invention to combine the system of Lin with the external modelocked oscillator of Price in order to decouple the pulse source from the other system components to eliminate the need to make adjustments to the oscillator when changing overall system output characteristics such as power and tuning. As stated above, however, Applicants submit that this conclusion is flawed. In the discussion below, Applicants address the basis for this conclusion and more particularly the assumptions that one skilled in the art would combine the teachings of Lin and Price to eliminate the need to make adjustments to the oscillator when changing (i) tuning and (ii) power.

#### Tuning

As stated above, the Office Action asserts that it would have been obvious to combine the teachings of Lin with the teachings of Price in order to eliminate the need to make adjustments to the oscillator when changing overall system output characteristics such as *tuning*. For support, the Office Action cites Price, column 3, lines 7-15, which discusses decoupling wavelength tuning from the operation of a pulse source.

“...[T]he use of an amplifier allows the tuning of the SSFS [soliton-self-frequency shift] to be achieved by varying the power of the amplifier pump source, instead of the prior art method of varying the output power of the pulses. This decoupling of the wavelength tuning from the operation of the pulse source can be advantageous in practice since the fundamental pulse source is left running and does not need to be adjusted at all to effect wavelength tuning of the system output.” (Price, column 3, lines 7-15.)

Applicants submit however, that unless the Examiner is maintaining that tuning of Lin’s oscillator is accomplished by varying the pump power<sup>1</sup>, the need to make adjustments to the oscillator when *tuning* is not eliminated. The fiber oscillator of Lin would still need to be adjusted when *tuning*. This is true even if the amplifier, variable attenuator, and compressor are external to the fiber oscillator disclosed by Lin. Lin discloses an optical resonator formed of a first reflective element 110...and a second reflective element 126. (See column 4, lines 13-21). Moreover, the “fiber laser 401 in FIG. 4E uses a fiber grating 410 as the first reflective element to provide optical feedback and frequency tunability.” (See Figure 4E and column 10, lines 35-

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<sup>1</sup> If the Examiner is maintaining that tuning is accomplished by varying the pump power, there is, of course, no need to move the variable attenuator outside the oscillator for the purpose of changing tuning – varying the pump power is used as explicitly taught by Price.

43). Accordingly, Lin teaches tuning using an adjustable fiber grating that forms part of the oscillator. Lin does not teach external tuning. Moreover, nowhere does Price teach removing the fiber grating 410 that forms part of the oscillator shown by Lin to outside the oscillator. Price instead teaches varying the pump to provide wavelength tuning. Combining the teachings of Lin and Price as set forth in the Office Action therefore does not eliminate the need to make adjustments to the oscillator when tuning. This reasoning set forth in the Office Action for making the combination of Lin and Price is thus flawed.

Power

Although Price only refers to decoupling wavelength tuning<sup>2</sup> from the operation of the pulse source, the Office Action asserts that it would be obvious to combine the teachings of Lin and Price to eliminate the need to make adjustments to the oscillator when changing *power* as well as tuning. Applicants submit, however, that even if the teaching of Lin and Price were combined by one skilled in the art to eliminate the need to make adjustments to the oscillator when changing *power*, one skilled in the art would not arrive at the invention as claimed, for example, in Claim 1, which recites that the a variable attenuator is disposed between the modelocked fiber oscillator and the amplifier.

Price explicitly teaches in column 3, lines 7-15,

“...varying the power of the amplifier *pump* source, instead of the prior art method of varying the output power of the pulses.” (Price, column 3, lines 7-15) emphasis added.

Instead of teaching varying the output power of the pulses, e.g., using a variable attenuator disposed between the modelocked fiber oscillator and the amplifier, Price chooses to vary the amplifier *pump* power. Accordingly, Price teaches a different approach than that used in the claimed invention and thus leads away from the claimed invention. Moreover, Price chooses a different approach which nevertheless results in “decoupling of the wavelength tuning from the operation of the pulse source [which] can be advantageous in practice since the fundamental pulse source...does not need to be adjusted at all to effect wavelength tuning of the system output.”<sup>3</sup> So even given the motivation set for the in the Office Action, one skilled in the art would follow the teachings of Price that lead away from the claimed invention. Accordingly, it

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<sup>2</sup> Price, column 3, lines 7-15.

would not have been obvious to one of ordinary skill in the art at the time of the invention in possession of both Lin and Price to arrive at disposing a variable attenuator between the modelocked fiber oscillator and the amplifier, such as such as recited in Claim 1, even for the purpose eliminating the need to make adjustments to the oscillator when changing overall system output characteristics such as power.

Importantly, Applicants note that Price never realizes any advantage to using a variable attenuator disposed between the modelocked fiber oscillator and the amplifier.<sup>4</sup> Applicants submit that Price's lack of recognition that any advantage may be achieved by disposing a variable attenuator between the modelocked fiber oscillator and the amplifier is compounded by Lin's teaching that the attenuator 122 shown in Figure 4A of Lin is to control *intracavity* affects.<sup>5</sup> Nowhere is there a *specific teaching* in Lin or in Price to move the attenuator outside of the cavity.<sup>6</sup> In fact, the only express teaching in Lin or Price is to use the variable attenuator within the oscillator and to use pumping to provide wavelength tuning.

Likewise, there is no basis for the assertion that it would be obvious to one skilled in the art, having possession of both Lin and Price to remove the variable attenuator from within the oscillator and instead include the variable attenuator between the modelocked fiber oscillator and the amplifier. Any such conclusion, as there is no such explicit teaching, is based on the impermissible use of hindsight.

Similar arguments apply to independent Claims 9 and 12. Applicants therefore respectfully request that the rejection of Claims 1, 9, and 12 be withdrawn.

#### **Claim 19**

With regard to Claim 19, the Office Action states that Lin discloses a spectral filter but that Lin does not teach that the amplifier and filter are external to the fiber oscillator. According

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<sup>3</sup> Id.

<sup>4</sup> In contrast, Applicants realize that attenuating the amplitude of the optical pulses coupled from the mode-locked fiber oscillator to the amplifier reduces the pulse width at an output of the compressor. Neither Lin nor Price realize this important innovation.

<sup>5</sup> The fiber laser 100 may include an optional variable attenuator 122 as shown in FIG. 4A to control the *intracavity* optical intensity to improve the mode locking by the saturable absorber 125. (Lin et al., column 10, lines 5-8) emphasis added.

<sup>6</sup> More generally, Applicants submit that Lin nor Price nowhere suggest decoupling a pulse source from other system components by *relocating* components within the modelocked oscillator of the pulse source to outside the modelocked oscillator. Price, for example, never teaches *removing* a variable attenuator, amplifier, or compressor that is within the oscillator and instead placing the variable attenuator, amplifier, or oscillator outside the oscillator to decouple the pulse source from other system components. Even still, one skilled in the art would be more influenced by, for example, the *specific teaching* of Lin of using a

to the Office Action, Price discloses a pulsed fiber laser system wherein the modelocked fiber oscillator is external to the other system components. The Office Action concludes that it would have been obvious to one of ordinary skill in the art at the time of the invention to combine the system of Lin with the external modelocked oscillator of Price in order to decouple the pulse source from the other system components to eliminate the need to make adjustments to the oscillator when changing overall system output characteristics such as power and tuning. Again, Applicants submit that this conclusion is flawed.

In particular, Applicants submit that even if the teaching of Lin and Price were combined by one skilled in the art to eliminate the need to make adjustments to the oscillator when changing tuning and power, one skilled in the art would not arrive at the invention as claimed, for example, in Claim 19, which recites a spectral filter disposed external to the modelocked fiber oscillator and between the oscillator and the amplifier.

Price explicitly teaches in column 3, lines 7-15, that “the use of an amplifier allows the tuning of the SSFS to be achieved by varying the power of the amplifier pump source.” Instead of teaching spectral tuning using a spectral filter disposed external to the modelocked fiber oscillator and between the oscillator and the amplifier, Price chooses to vary the *pump*. Accordingly, Price teaches a different approach than that recited in Claim 19 and thus leads away from the claimed invention. Moreover, Price chooses a different approach which nevertheless results in “decoupling of the wavelength tuning from the operation of the pulse source [which] can be advantageous in practice since the fundamental pulse source...does not need to be adjusted at all to effect wavelength tuning of the system output.”<sup>7</sup> So even given the motivation set for the in the Office Action, one skilled in the art would follow the teachings of Price that lead away from the claimed invention.

As Price teaches a completely different arrangement for accomplishing spectral tuning (i.e., by varying the pump), there is no teaching for a spectral filter disposed external to the modelocked fiber oscillator. Moreover, there is no teaching for a spectral filter disposed and between the oscillator and the amplifier to reduce the pulse width of optical pulses coupled from the fiber oscillator to the amplifier (as compared to, for example, a spectral filter disposed

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variable attenuator for controlling intracavity oscillations and the *specific teachings* of Price of using variation of pump power for wavelength tuning rather than any *speculative generalized notion* allegedly taught by Price.

<sup>7</sup> Price, column 3, lines 7-15.

elsewhere, e.g., after the amplifier to tailor the spectral shape of the output thereof).<sup>8</sup> Accordingly, it would not have been obvious to one of ordinary skill in the art at the time of the invention in possession of both Lin and Price to arrive at disposing a spectral filter external to the modelocked fiber oscillator and between the oscillator and the amplifier, such as recited in Claim 19.

Importantly, Applicants note Price's lack of realization that any advantage may be achieved by disposing a spectral filter external to the modelocked fiber oscillator and between the oscillator and the amplifier. There is no teaching in Price (or Lin) that suggests disposing a spectral filter between the oscillator and the amplifier. Price does not realize, for example, the important achievement that disposing a spectral filter between the oscillator and the amplifier can cause the temporal pulse width of the optical pulses coupled from the modelocked fiber oscillator to the amplifier to be reduced.<sup>9</sup> Applicants submit that this result is counter-intuitive and thus not obvious.

Applicants emphasize that nowhere is there a *specific teaching* in Lin or in Price to move the spectral filter outside of the cavity and between the oscillator and the amplifier. Moreover, Applicants submit that neither Lin nor Price teach the general principle as asserted in the Office Action that by relocating components within the modelocked oscillator outside the modelocked oscillator, the pulse source can be decoupling from other system components. Price, for example, never teaches removing a spectral filter or amplifier that is within the oscillator and instead placing the spectral filter or amplifier outside the oscillator to decouple the pulse source from other system components. Even still, one skilled in the art would be more influenced by, for example, the *specific teaching* of Price of using variation of pump power for wavelength tuning rather than any *speculative generalized notion* allegedly taught by Price. Additionally,

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<sup>8</sup> Applicants further note that Price focuses on wavelength tuning, not for example, spectral shaping. See, e.g., at column 7, line 55, to column 8, line 3, which states that "[t]he nonlinear evolution of the pulses depends critically on the pulse peak power, so the wavelength of the pulses 18, in the form of Raman solitons, at the output of the amplifier 14 is tuned by varying the gain in the amplifier, which is controlled by varying the power of the pump radiation from the pump laser 16. In this way, single wavelength (monocolor) soliton output pulses 18 can be wavelength-tuned throughout the 1.06-1.33  $\mu\text{m}$  range."

<sup>9</sup> In contrast, Applicants have realized the counterintuitive result that a spectral filter disposed external to the modelocked fiber oscillator and between the oscillator and the amplifier, and configured to receive the optical output of the modelocked fiber oscillator prior to reaching the amplifier, and that has a spectral transmission with a band edge that overlaps the spectral power distribution of the optical output of the modelocked fiber oscillator so as to attenuate a portion of the spectral power distribution, thereby reduces the spectral bandwidth and causes the pulse width of the optical pulses coupled from the modelocked fiber oscillator to the amplifier to be reduced.

Applicants point out that such a generalization is merely the use of hindsight, which is impermissible under the law.

Likewise, there is no basis for the assertion that it would be obvious to one skilled in the art, having possession of both Lin and Price, to include a spectral filter disposed between the oscillator and the amplifier. Any such conclusion, as there is no specific teaching, is based on the impermissible use of hindsight.

Similar arguments apply to independent Claim 27. Applicants therefore respectfully request that the rejection of Claims 19 and 27 be withdrawn.

**Claims 2-5, 9-16, 20-23, 25, 27-30 and 75-76**

As discussed above, Claims 1, 9, 12, 19 and 27 are patentable over Lin either alone or in view of Price. Claims 2-5, 10, 11, 13-16, 20-23, 25, 28-30 and 75-76 depend from Claims 1, 9, 12, 19 and 27 and include all of the features of Claims 1, 9, 12, 19 and 27 and recite unique combinations of additional features not taught or suggested by Lin either alone or in view of Price and are therefore patentable over Lin in view of Price. Applicants therefore respectfully request that the rejections of Claims 2-5, 10, 11, 13-16, 20-23, 25, 28-30 and 75-76 be withdrawn.

**No Disclaimers or Disavowals**

Although communications, present and past, may include alterations to the application or claims, or characterizations of claim scope or referenced art, Applicant is not conceding in this application that previously pending claims are not patentable over the cited references. Rather, any alterations or characterizations are being made to facilitate expeditious prosecution of this application. Applicant reserves the right to pursue at a later date any previously pending or other broader or narrower claims that capture any subject matter supported by the present disclosure, including subject matter found to be specifically disclaimed herein or by any prior prosecution. Accordingly, reviewers of this or any parent, child or related prosecution history shall not reasonably infer that Applicant has made any disclaimers or disavowals of any subject matter supported by the present application.

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**SUMMARY**

Applicants respectfully submit that all of the pending claims are allowable. Applicants respectfully request that the Examiner withdraw the rejections and pass Claims 1-5, 9-16, 19-23, 25, 27-30 and 75-76 to allowance.

If Examiner has any questions regarding the foregoing he may contact the undersigned at the telephone number listed below.

Please charge any additional fees, including any fees for additional extension of time, or credit overpayment to Deposit Account No. 11-1410.

Respectfully submitted,

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